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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]The escape guide sign with which this invention performs escape guide in road sign; emergencies, such as a regulatory sign and a guide sign, etc.;. It can be used for direction board for security; etc. which are used for a foot walk etc. There are no lighting facilities or it is related with the luminescence type information display device which can provide information required for a visual recognition person also in in the dark [the night in the states (breakage, interruption to service, etc.) where it cannot be used, in a tunnel, etc.]. Light storage excitation is carried out by the light of the retroreflection field which has reflective ability, and a wavelength area including ultraviolet rays in detail, It is related with the luminescence type information display device possessing the light irradiation device which irradiates the surface of the information-display object which has a light storage luminous region which emits light in visible light, and this information-display object with the light of the wavelength area which includes ultraviolet rays intermittently or intermittently.

[0002]

[Description of the Prior Art]the retroreflection sheet which turns light in the direction of a light source, and the security article which those who install in a road on the occasion of a road sign, road repairing, traffic control, etc. which are installed, for example in a road side edge, and are engaged in road repairing, traffic control, etc. from the former wear is made to reflect -- use -- now, it is. Especially a road sign sticks a retroreflection sheet on substrates, such as a metal plate, Indicators, such as a character, a sign, and a pattern, are given to the surface by printing etc., or, In [from the retroreflection sheet in which colors differ suitably, start the background used as these indicators and its background, respectively, combine it, and it is created by pasting together to this substrate etc., and] night etc., Turn the light from light sources, such as a headlight etc. of vehicles, such as a car it runs, in the direction of a light

source of a vehicle, i.e., the direction it runs, it is made to reflect, the visibility outstanding to the driver of the vehicle which is a visual recognition person of a sign is provided, and it has the outstanding characteristic of making clear signal transduction possible.

[0003]However, the display using these retroreflection sheets carries out retroreflection of the light, only when the light from a light source is received with a natural thing, and it demonstrates the visibility outstanding to the direction of a light source.

The visibility is remarkably inferior when the place to recognize visually is greatly separated with the direction of a light source, Therefore, also when it is hard to recognize visually from a pedestrian and a vehicle approaches these signs too much, an observation angle in case a driver looks at a sign becomes large, and the outstanding visibility is acquired only under [-- the visibility falls remarkably --] very limited conditions.

It always suited that the light from a streetlight or the circumference does not appear easily with the direction board in a river, a mountain slope, etc., etc. for example, at the place which is hardly expectable even as for existence of the direction board itself.

[0004]For this reason, in the recent years when higher safety, a propaganda effect, etc. have come to be searched for, In [the retroreflection type display of the conventional type which has only retroreflective properties of the visibility is insufficient, and] especially night etc., A ***** display has come to be expected strongly the visibility in the case of there being no light source or being limited, and the visibility over a different direction from the direction of a light source.

[0005]On the other hand, also when there is no light by the headlight of vehicles, in order to acquire visibility, the inner illumination type plotting board and the outer illumination type plotting board are also used, but. When these are used for height installation type signs like a road sign or a guide sign, In the inner illumination type plotting board, it becomes large-scale [the sign itself] and equipment cost increases, the maintenance of exchange of the light, the repair accompanying breakage, etc. is not easy, either, and since great electric power is used continuously at night, a running cost also has the problem of becoming expensive. It was difficult to express correctly contents [the problem that the boundary of the color of an indicator bleeds from moreover and the former, or a character is crushed has generated, and] to transmit.

[0006]In [while it has the strong point in which the visibility outstanding also not only to the direction of a light source but visual recognition persons other than the direction of a light source is shown in the outer illumination type plotting board] a sign with much amount of information of a guide sign etc., In the position which was far apart from this guide sign, since [which] light volume is insufficient, it is difficult for an automobilism person to identify the contents, and when it approaches, the inconvenience of being required has also recognized all the contents visually in an instant.

[0007]The visual guidance sign which makes LED (Light Emitting Diode) emit light intermittently using a solar cell, and the sign plate which makes EL (Electro Luminescence) emit light are also used. Although the former is excellent in deriving a look effectively according to luminescence of each point by making the point arranged, for example according to the purpose emit light one by one by a high cycle, it is unsuitable for carrying out continuation lighting of the large field. In the limitation which uses the usual EL element while great expense starts carrying out continuation lighting of the large field, since the price of latter gaiety and an EL element is very expensive, Since it is difficult to be based on the shape which it is going to display and to cut this, there is also a problem that the flexibility of the design of the shape which can be displayed becomes small.

[0008]The marking sheet with which the light storage sides of a large number by light storing material were regularly scattered in the reflector which some trials for solving these problems are also made, for example, has reflective ability on the surface in JP,9-71911,A is indicated about the road sign stuck on sign surfaces.

The trial which sticks on some existing signs the light storing sheet which used light storing material is also known.

[0009]It is promptly begun after sunset however, to decrease light storage ***** light energy with a light in the daytime generally speaking of light storing material, Below in 20 mcd/m^2 , the luminescent ability of a light storage side will become 2 to 3 hours after sunset, and what is considered to excel most now will lose most visibility, and will lose the performance as a sign. Therefore, it was restricted in sunset of after 2 to 3 hours at most that such a sign functions effectively, most visibility by a pedestrian was lost past midnight in the mountain slope etc. which do not have a light source on the outskirts, and the function as an escape guide sign was completely insufficient. In the city which can usually expect the light source from the circumference, when the electric current is cut off according to an accident, a disaster, etc. past midnight, in several hours, the function as a refuge sign cannot be expected at all. Thus, even if it passed over midnight in the emergency etc. for security, such as a pedestrian and a vehicle driver, the display of being simple and the saved type of energy which can maintain visibility continuously was called for.

[0010]

[Problem(s) to be Solved by the Invention]This invention solves the problem of the conventional technology like these above, and by a very easy and cheap method. the saved-energy type information display device which shows the visibility always outstanding also in dark places, such as night from sunset to dawn, and a tunnel, and can be especially used for signs, such as a road sign and a refuge sign, suitably -- it is going to provide -- it is a thing.

[0011]This invention persons have examined the method of maintaining the light quantity of

light storing material within fixed limits in which prolonged visual recognition is possible in order to improve the visibility in the dark [of information-display objects, such as signs having the field which has reflective ability, and the field which has light storage luminescence,]. As a result, it finds out that is a short time and some light storing materials are efficiently excited by the ultraviolet rays of a specified wavelength rather than visible light, By combining the light irradiation device which irradiates with the light which includes ultraviolet rays in the information-display object which has a light storage luminous region containing such a light storing material, it knew that the desired end could be attained and this invention was completed.

[0012]

[Means for Solving the Problem]a retroreflection field which has reflective ability in this way according to this invention -- and, Light storage excitation is carried out by light of a wavelength area including ultraviolet rays, a light irradiation device which irradiates the surface of an information-display object which has a light storage luminous region which emits light in visible light, and this information-display object with light of a wavelength area which includes ultraviolet rays intermittently or intermittently is provided, and a luminescence type information display device characterized by things is provided.

[0013]Hereafter, it explains concretely, referring to drawings for an embodiment of a luminescence type information display device of this invention.

[0014]Drawing 1 is a front view of a direction board for luminescence type security which is one embodiment of this invention, and drawing 2 is the side view. (1) is a support set up by road side edge, and an information-display object (2) is attached to the upper part of this support (1). An information-display sheet (4) which an information-display object (2) is stuck on the surface of a plate (3) of a rectangle currently directly fixed to a support, and makes the principal part of this information-display object (2), It is stuck on the surface of this information-display sheet (4), and this information-display sheet (4) is consisted of a protective sheet (5) aiming at protection from dirt, such as rain and dust, improvement in weatherability, etc. An information-display sheet (4) comprises an outer edge section (8) which borders a background (7) and an information-display sheet (4) used as an indicator (6') which consists of an indicator (6) which consists of characters, and a sign, this indicator (6), and the background of (6'). And near the top chord of this information-display object (2), a light irradiation device (9) which irradiates with light of a wavelength area which includes ultraviolet rays intermittently or intermittently is formed.

[0015]In drawing 1, the above-mentioned indicator (6), (6'), and an outer edge section (8) can be made into a retroreflection field (A), and a background (7) can be made into a light storage luminous region (B). In this case, an indicator (6), (6'), and an outer edge section (8) where shape is different can also be considered as a retroreflection field (A) in which a color tone is

different, respectively. Conversely, an indicator (6), (6'), and an outer edge section (8) can be made into a light storage luminous region (B), and a background (7) can also be made into a retroreflection field (A). Furthermore, it can form using a light storage luminescence retroreflection sheet (C) in which a retroreflection field (A) and a light storage luminous region (B) are distributed regularly into an indicator (6), (6'), and one sheet if required, as shows drawing 9 an outer edge section (8), and can also carry out. In this case, the background (7) may not have retroreflection ability or light storage luminescence ability, either.

[0016]A formation method of the above-mentioned retroreflection field (A) and a light storage luminous region (B), Not a thing limited especially but a retroreflection sheet in which the whole surface serves as a retroreflection field substantially, for example. From three sorts of things from which a color tone of (calling it a whole surface retroreflection sheet hereafter) differs. It can form by starting according to shape of an indicator (6), (6'), and an outer edge section (8), respectively, and the whole surface's starting and combining a background (7) substantially from a light storage light-emitting sheet used as a light storage luminous region, and pasting together to a plate (3) as an information-display sheet (4). It is preferred to stick a protective sheet (5) for the purpose of antifouling property and weatherproof improvement from on the furthermore. On the contrary, an indicator (6), (6'), and an outer edge section (8) can be started from a light storage light-emitting sheet, and a background (7) can also be started and combined from a whole surface retroreflection sheet.

[0017]At least two sorts of indicators (6) and (6') are started from a light storage luminescence retroreflection sheet (C) as aforementioned, A background (7) and the outer edge section (8) can also stick an indicator (6) started from a light storage luminescence retroreflection sheet (C) to this using a plate (3) which started and combined from unique color sheets, or was painted by proper color tone.

[0018]In a layer which is in the surface or its upper part using a whole surface retroreflection sheet of an achromatic series. An indicator (6), (6'), and an outer edge section (8) are printed in transparent ink of two or more sorts of different color tones, The background (7) can also create an information-display sheet (4) in which a retroreflection field (A) and a light storage luminous region (B) were formed by printing using ink containing light storing material. Conversely, an indicator (6), (6'), and an outer edge section (8) can be printed in ink containing light storing material, and a background (7) can also be printed using transparent ink. It is preferred to stick a protective sheet (5) on the surface of an information-display sheet (4) obtained, if antifouling property, weatherability, etc. are taken into consideration in such a case, When [at which a protective sheet (5) is furthermore stuck on the surface of a whole surface retroreflection sheet] carried out, such printing itself can also be performed to the back (field of a side which touches a whole surface retroreflection sheet) of this protective sheet (5).

[0019]Drawing 3 is a front view of a luminescence type road sign which are other embodiments

of this invention, and drawing 4 is the side view. Although composition of this road sign is the same as that of above-mentioned drawing 1 and drawing 2 almost, an information-display sheet (4) comprises an indicator (6) which consists of signs, and a background used as the background of this indicator (6), and an outer edge section (8) does not have it.

[0020]Also in drawing 3, like a case of drawing 1, either an indicator (6) or a background (7) can be made into a retroreflection field (A), and another side can be made into a light storage luminous region (B). As a formation method of such a retroreflection field (A) and a light storage luminous region (B), An indicator (6) and a background (7) are started and combined from a whole surface retroreflection sheet and a light storage light-emitting sheet like a case of drawing 1 according to each of the shape, It pastes together to a plate (3) as an information-display sheet (4), and a method of forming by sticking a protective sheet (5) from on the can be adopted. From a light storage luminescence retroreflection sheet (C), start an indicator (6) and a background (7), It can also be based on a method of sticking an indicator (6) started by this from a light storage luminescence retroreflection sheet (C) using a plate (3) which started and combined from color sheets colored a proper color tone, or was colored a proper color tone. It is also possible to print either an indicator (6) or a background (7) with a colored invisible writing ink in the surface of a whole surface retroreflection sheet of an achromatic series or a layer in the upper part, and to print another side in it using ink containing light storing material furthermore. In this case, it is preferred to stick a protective sheet (5) on the surface of an information-display sheet (4) obtained for the same reason as drawing 1, When [at which a protective sheet (5) is furthermore stuck on the surface of a whole surface retroreflection sheet] carried out, such printing itself can also be performed to the back of this protective sheet (5).

[0021]Drawing 5 is also a front view of a luminescence type direction board which are other embodiments of this invention, and drawing 6 is the side view. a diagram (7") on which an indicator (6) which consists of a figure with which an information-display sheet (4) is all different although composition of this direction board is the same as that of said drawing 1 and 2 almost, (6'), and a mountain are drawn -- it comprises the background (7) and (7') therefore divided, and there is no outer edge section (8). And a light irradiation device (9) is formed near the lower side of an information-display object (2). (10) is an electric cord linked to a light irradiation device (9), and (11) is a socket linked to a power supply.

[0022]The indicator (6) and (6') which consists of the above-mentioned different figure in drawing 5 is made into a light storage luminous region (B), It is also possible to be able to make the two backgrounds (7) and (7') classified by a diagram (7") into a retroreflection field (A) where color tones differ, and to make a diagram (7") into a light storage luminous region (B) in this case. Conversely, an indicator (6), (6'), and a diagram (7") are made into a retroreflection field (A) where color tones differ, respectively, and it is good also considering

the background (7) and (7') as a light storage luminous region (B). A formation method of a retroreflection field (A) and a light storage luminous region (B) is the same as that of a case of drawing 1 and drawing 3 in general.

[0023]Drawing 7 and drawing 8 are the perspective views of a luminescence type road sign suitable for installing in a road shoulder of a road which is an embodiment of further others of this invention, or annexing to a guardrail. In this mode, unlike drawing 1 - a case of six, an information-display object (2) consists of indicators (6), and is directly stuck on a square-shaped support (1). A light irradiation device (9) is installed on a plinth of a rectangle which fixes a support (1) to a ground surface.

[0024]In drawing 7, an indicator (6) is formed in one sheet with a light storage luminescence retroreflection sheet (C) of a different type from drawing 9 in which a retroreflection field (A) and a light storage luminous region (B) are distributed regularly. In drawing 8, an information-display object (2) is constituted by combination of two indicators (6) and (6'), can make the either a retroreflection field (A) formed with a whole surface retroreflection sheet, and can make the other a light storage luminous region (B) formed with a light storage light-emitting sheet. It is also possible to form either one of this indicator (6) or (6') with a light storage luminescence retroreflection sheet (C), and to form the other by a whole surface retroreflection sheet or color sheets.

[0025]In an information-display object (2) used for this invention explained according to figures above, a retroreflection element which constitutes a retroreflection field (A), Not a thing limited especially but a lens mold retroreflection element which consists of a minute sphere lens and metal membrane light reflection layers, such as a glass bead, for example, a cube-corner type retroreflection element arranged so that a field which faces may face at an angle of about 90 degrees mutually, etc. can be mentioned. Also to a lens mold retroreflection element, for example An open lens mold retroreflection element, There are a capsule lens mold retroreflection element, an enclosure lens mold retroreflection element, etc., and cube-corner type retroreflection elements also include a capsule cube-corner type retroreflection element, a metal deposition cube-corner type retroreflection element, etc. further, for example.

[0026]an open lens mold retroreflection element has structure where a hemispherical surface was mostly covered with a light reflex nature metal membrane side burial support is carried out and this minute sphere lens is laid under the surface by the side of light incidence of a support layer so that a minute sphere lens of these large number may be further alike substantially and it may stand in a line.

[0027]With a capsule lens mold retroreflection element, on the surface by the side of this light transmittance state enveloping layer of a light transmittance state enveloping layer, a support layer, and this support layer. substantially, many minute sphere lenses are further alike, and are located in a line -- as -- the -- mostly, burial support is carried out and a hemispherical

surface, A layer of a reflective minute sphere lens in which the hemispherical surface currently laid underground is covered with a light reflex nature metal membrane, And it consists of a bond part of a continuation confounding line which connects selectively a light transmittance state enveloping layer and a support layer, A seal subsection vacant room (capsule) of a large number surrounded by this bond part by light transmittance state enveloping layer, support layer, and a bond part is formed, Many reflective minute sphere lenses are enclosed in this seal subsection vacant room, and what has the structure where an air layer is formed between this minute sphere lens and a light transmittance state enveloping layer is said.

[0028]substantially, it resembles an enclosure lens mold retroreflection element further, and ranks with the back (field of the light incidence side and an opposite hand) of a light transmittance state support layer and this light transmittance state support layer with it -- as -- a layer of a minute sphere lens of the large number by which burial support is mostly carried out in a semispherical part. A side [it is not laid under the light transmittance state support layer of this minute sphere lens] is mostly formed along the surface of a semispherical part, What comprises a light reflex nature metal membrane currently formed in the surface of a side which is not in contact with a minute sphere lens of a focal layer of a light transmittance state established so that it might have the thickness that a substantial focus of this minute sphere lens comes to the surface of a side which is not in contact with the minute sphere lens, and this focal layer is said. A surface protection layer of a light transmittance state can also be further laminated on the surface by the side of light incidence of a support layer if needed.

[0029]With a capsule cube-corner type retroreflection element. A light transmittance state enveloping layer, a layer of a cube-corner type retroreflection element arranged at the back of this enveloping layer, It consists of a support layer and a layer of this cube-corner type retroreflection element, and an air layer between these *****. This air layer is formed by connecting these both layers selectively by a bond part between a layer of this cube-corner type retroreflection element, and this support layer, as it leaves a gap, and says a thing currently divided into many seal subsection vacant rooms by this bond part. A light transmittance state surface protection layer can also be further laminated if needed on the surface by the side of light incidence of a light transmittance state enveloping layer.

[0030]A metal deposition cube-corner type retroreflection element means what consists of a light reflex nature metal membrane currently formed in a layer of a cube-corner type retroreflection element arranged at least at the back of a light transmittance state enveloping layer and this enveloping layer, and all the surfaces of this cube-corner type retroreflection element. A light transmittance state surface protection layer can also be further laminated if needed on the surface by the side of light incidence of a light transmittance state enveloping layer.

[0031]As a retroreflection element used in this invention, Among these From a viewpoint of

appearance, antifouling property, and weatherability to a capsule lens mold retroreflection element. It is preferred to adopt an enclosure lens mold retroreflection element and a capsule cube-corner type retroreflection element, and especially adoption of a capsule lens mold retroreflection element from a viewpoint of height of retroreflection luminosity and a capsule cube-corner type retroreflection element is preferred.

[0032]As a support layer used since a retroreflection element is constituted in this invention, For example, it is independent about acrylic resin, urethane system resin, polyester system resin, VCM/PVC system resin, vinyl acetate system resin, polyolefin system resin, fluororesin, polyamide system resin, etc., is a form where copolymerization of each resinous principle was carried out mutually, or can blend and use.

[0033]A support layer may construct a bridge by isocyanate cross-linking agent, melamine cross-linking agent, a metal system cross linking agent, etc., and may also contain various bulking agents, such as a cellulosic, inside bridge construction resin of a multistage polymerization mold, colorant, UV luminous fluorescent agent, light storing material, a thermostabilizer, and an ultraviolet ray absorbent, if needed. As for base material layer thickness, it is usually preferred that it is about 20-200 micrometers.

[0034]When a retroreflection element in this invention is a lens mold retroreflection element, A support layer may not necessarily come out further, a certain necessity may not be, and it may consist of a reinforcement layer laminated so that the surface of a side which is not laying underground a minute sphere lens of a combining layer which lays underground and supports a minute sphere lens, and this combining layer may be touched if needed. As for especially thickness of this reinforcement layer, it is usually convenient to set up within the limits of 30-80 micrometers 10-100 micrometers. It may have an interlayer for improving the adhesive property of both layers in the middle of this combining layer and a reinforcement layer more.

[0035]A light transmittance state protective layer laminated by retroreflection element in this invention [an usable light transmittance state enveloping layer and if needed], It has the total light transmittance of not less than 40% preferably not less than at least 20%, If it has a certain amount of pliability, there will be no restriction in particular in the construction material, For example, an acrylic resin film, a fluororesin film, a polyurethane system resin film, a VCM/PVC system resin film, a polycarbonate system resin film, a polyester system resin film, a polyolefin-system-resin film, etc. are mentioned.

[0036]Although thickness of an enveloping layer is changeable over a wide range according to a use of a retroreflection sheet, etc., it is usually preferably good to set [20-200-micrometer / 40-150-micrometer] up within the limits of 50-100 micrometers preferably especially.

Thickness of a surface protection layer is usually preferably good to set [10-200-micrometer / 20-150-micrometer] up within the limits of 30-100 micrometers preferably especially in a similar manner.

[0037]About a whole surface retroreflection sheet which consists of various kinds of retroreflection elements described above, and a manufacturing method for the same. An open lens mold retroreflection sheet For example, a U.S. Pat. No. 2,326,634 specification, ;, for example, a capsule lens mold retroreflection sheet,;, for example, an enclosure lens mold retroreflection sheet, to JP,60-194405,A (= U.S. Pat. No. 4,653,854 specification) etc. at JP,57-189839,A etc. JP,56-2921,B. (= U.S. Pat. No. 4,025,674 specification) etc. -- as for,;, for example, a capsule cube-corner type retroreflection sheet, JP,49-106839,A,;, for example, a metal deposition cube-corner type retroreflection sheet, on U.S. Pat. No. 3,417,959 specifications etc. (= U.S. Pat. No. 3,712,706 specification) etc. --; statement of is done and it replaces with those concrete description with quotation of these articles here.

[0038]In order to stick this retroreflection sheet on predetermined adherend, a releasing base for preventing garbage etc. from a heat sensitivity type or a pressure sensitivity type adhesives layer adhering to the back of said support layer or said light reflection layer, and usually adhering to an adhesives layer, etc. may be formed in a whole surface retroreflection sheet obtained one by one, and may be used for it. A kind in particular of resin which forms this adhesives layer is not restricted, and resin used as usual resin for adhesives should just be used for it, for example, acrylic resin, silicon system resin, rubber system resin, phenol system resin, etc. are used. It excels in endurance especially and good acrylic resin or phenol system resin of the adhesion characteristic is used suitably.

[0039]An information-display object (2) in this invention has the big feature in a point of having a light storage luminous region (B) which emits light even in a place which does not have lights, such as night, with a retroreflection field (A) described above. This invention persons have examined a method of maintaining within fixed limits which can recognize [prolonged] light quantity of a light storage luminous region visually for the purpose of improving visibility in in the dark [which has a retroreflection field and a light storage luminous region as mentioned above / of an information-display object]. As a result, it found out that some light storing materials included in a light storage luminous region emitted a short time and visible light [it is excited efficiently and] with a peak of 450-550 nm by ultraviolet rays of specified wavelength regions, such as 310-400 nm, rather than visible light. And it knew that the desired end could be attained by combining a light irradiation device which irradiates with light which includes a 310-400-nm ultraviolet region in an information-display object which has a light storage luminous region containing such a light storing material.

[0040]A luminescence type information display device of this invention a light irradiation device (9) mentioned later in this way conjointly, Of course, also in night, a retroreflection field (A) turns light from light sources, such as a headlight of a car, in the direction of a light source, and carries out retroreflection, for example, and it functions as providing visibility outstanding to a visual recognition person of the directions of a light source, such as an automobilism person,

that visibility which reflected lights, such as sunlight, and was excellent is shown in the daytime. Also in [at night] in the dark, of course a light storage luminous region (B) light of lighting of sunlight in the daytime and a fluorescent lamp at night, a headlight of a car, etc., Also in light storage **** and darkness in which a light source completely became even if, discharge luminescence of the light is gradually carried out by light including ultraviolet rays of the above-mentioned wavelength area irradiated intermittently or intermittently from a light irradiation device (9) put side by side, and luminescence is maintained, and nighttime visibility outstanding to a driver, a pedestrian, etc. is provided.

[0041]The above-mentioned light storage luminous region (B) is started as mentioned above according to desired shape from a light storage light-emitting sheet, . [whether light storage luminescence is used and printed in a layer which combines with what was similarly started in desired shape from a whole surface retroreflection sheet, or is in the surface of a whole surface retroreflection sheet, or its upper part, and]Or it becomes the main components of an information-display object (2) created by cutting down a light storage luminescence retroreflection sheet (C) which consists of a light storage luminous region and a retroreflection field beforehand according to desired shape.

[0042]As light storage performance of a light storage luminous region (B) of an information-display object (2) in this invention, After neglecting this information-display object to in the dark for 12 hours, this is irradiated with a D65 common light source for 30 minutes by light-receiving intensity 1000 lx, Subsequently, when it is neglected for 10 minutes to in the dark, it is preferred [more than 120 mcd/m^2] in the dark to choose a kind and loadings of light storing material so that it may have the afterglow brightness more than 140 mcd/m^2 preferably. If afterglow brightness is more than this lower limit, since a light storage luminous region fully demonstrates visibility, it is preferred. Afterglow brightness of the above-mentioned light storage luminous region is measured in accordance with a method of carrying out the following.

[0043]Measurement of afterglow brightness: After neglecting a sample of an information-display object (100 mm x 100 mm) to in the dark for 12 hours, glaring for 30 minutes and neglecting it for 10 minutes subsequently to in the dark by light-receiving intensity 1000 lx using a D65 common light source, it is a luminance meter from distance of about 30 cm from this sample. Afterglow quantity of about 5 mmphi was measured about five proper places of the light storage luminous region surface using ["LS-100" by Minolta Camera Co., Ltd.], and afterglow brightness of an information-display object was determined according to a following formula.

Afterglow brightness (mcd/m^2)

= Area share (%) /100 of an average afterglow quantity x light storage luminous region [0044]

light which a light storage luminous region (B) in this invention received as mentioned above -- light storage **** -- light storing material and a resinous principle which carry out discharge luminescence gradually are contained. This light storage luminous region is formed to resinous principle 100 weight section with a light storage luminescence resin composition which carries out 200-700 weight-section content of the light storing material still more preferably 150 to 800 weight section more preferably 100 to 900 weight section. Since visibility where sufficient light storage luminescence function was obtained and which was excellent will be acquired if an addition of light storing material is more than this lower limit, it is desirable, Since inconvenience, like a formed light storage luminous region becomes hard too much, and becomes weak will not arise and the characteristics, such as mechanical strength and pliability, will not be spoiled if it is below this upper limit, it is desirable.

[0045]Also in [at night] in the dark, of course the above-mentioned light storing material light of lighting of sunlight in the daytime and a fluorescent lamp at night, a headlight of a car, etc., . Glare intermittently or intermittently from a light irradiation device (9) put side by side. Generally light storage excitation is preferably carried out by 310-400 nm of lights [330-395 nm of] which include ultraviolet rays of a 360-390-nm wavelength area still more preferably, It requires that a light source is what carries out discharge luminescence of the visible light with a peak of 450-550 nm gradually also in darkness which completely became even if. And as for a light storage luminous region (B) formed with such a light storing material, it is preferred to satisfy the aforementioned afterglow brightness conditions.

[0046]As such a light storing material, from a viewpoint of merit of light storage performance to oxide stock light storing material. A metallic oxide especially expressed with general formula MAI_2O_4 (M expresses at least one sort of alkaline-earth metals among a formula) is used as a mother crystal, It is preferred that it is the light storing material in which 1×10^{-6} - 0.2 contain a rare earth metal atom as an activator comparatively (however, a sum total atomic number of a metal M atom and a rare earth metal atom is set to 1). It is preferred that it is at least one sort of metal chosen from a group which consists of Ca and Ba ** Sr as these alkaline-earth metals, and as a rare earth metal, It is good that it is at least one sort of metal chosen from a group which consists of Sc, Y, La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu. Further such a light storing material as a coactivator if needed Mn, It is preferred that it is the light storing material in which 1×10^{-6} - 0.2 contain comparatively (however, a sum total atomic number of a metal M atom, a rare earth metal atom, and coactivator metal is set to 1) at least one sort of metal chosen from a group which consists of Sn and Bi.

[0047]Among the above-mentioned light storing materials, as a typical thing, For example, $SrAl_2O_4:Eu$, $SrAl_2O_4:Eu, Dy$, $SrAl_2O_4:Eu, Nd$, $SrAl_2O_4:Eu, Pr$, $SrAl_2O_4:Eu, Sm$, $SrAl_2O_4:Eu, Tb$, $SrAl_2O_4:Eu, Ho$, $SrAl_2O_4:Eu, Mn$, $SrAl_2O_4:Eu, Sn$, $SrAl_2O_4:Eu, Bi$, $CaAl_2O_4:Eu, Nd$,

$\text{CaAl}_2\text{O}_4\text{:Eu, Sm}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Tm}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, La}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Ce}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Pr}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Sm}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Gd}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Tb}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Dy}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Ho}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Er}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Tm}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Yb}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Lu}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Mn}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Sn}$, $\text{CaAl}_2\text{O}_4\text{:Eu, Nd, Bi}$, $\text{Ca}_{0.9}\text{Sr}_{0.1}\text{aluminum}_2\text{O}_4\text{:Eu, Nd, La}$, $\text{Ca}_{0.9}\text{Sr}_{0.1}\text{aluminum}_2\text{O}_4\text{:Eu, Nd, Dy}$, $\text{Ca}_{0.7}\text{Sr}_{0.3}\text{aluminum}_2\text{O}_4\text{:Eu, Nd, Dy}$, $\text{Ca}_{0.9}\text{Sr}_{0.1}\text{aluminum}_2\text{O}_4\text{:Eu, Nd, Ho}$, $\text{Ca}_{0.7}\text{Sr}_{0.3}\text{aluminum}_2\text{O}_4\text{:Eu, Nd, Ho}$, etc. are mentioned. These can be used as one sort or two sorts or more of mixtures.

[0048]Generally [a persistence characteristic measured in accordance with a following method as these light storing material] it is [more than 150 mcd/m^2 / more than 200 mcd/m^2] preferably good to use a thing more than 250 cd/m^2 still more preferably.

[0049]Measurement of a persistence characteristic : 0.05g in the light storing material powder end of a sample to the data pan made from aluminum 8 mm in inside diameter **** picking (sample thickness 0.1 g/cm^2), After keeping it to an in the dark one for about 15 hours, eliminating an afterglow, glaring for 30 minutes and neglecting it for 10 minutes subsequently to in the dark by light-receiving intensity 1000 lx using a D65 common light source, it is a luminance meter from distance of about 30 cm from this sample. Afterglow quantity of a sample is measured using ["LS-100" by Minolta Camera Co., Ltd.].

[0050]A resinous principle contained with light storing material in a light storage luminescence resin composition which forms a light storage luminous region (B), If it is resin which can distribute and hold light storing material, the construction material in particular is not what is limited, For example, acrylic resin, urethane system resin, polyester system resin, fluororesin, Although VCM/PVC system resin, vinyl acetate system resin, polyethylene system resin, a polypropylene resin, polycarbonate system resin, etc. are mentioned, and these are independent respectively, it is the form by which copolymerization was carried out or it is blended and used, excelling in weatherability in these -- processing -- proper good acrylic resin, urethane system resin, polyester system resin, and fluororesin are preferred, and acrylic resin is the most preferred.

[0051]Into the above-mentioned light storage luminescence resin composition, various additive agents other than a resinous principle and light storing material, such as usual colorant, colorant of others, such as a fluorescence artificial color agent, light stabilizer, a thermostabilizer, a bulking agent, a cross linking agent, may be blended if needed.

[0052]Said light storage light-emitting sheet used in this invention if needed in order to form a light storage luminous region (B), How to fabricate such a light storage luminescence resin

composition to a sheet shaped by methods, such as hot extrusion molding and press forming; Into a proper organic solvent, make it dissolve or distribute and this resin composition is used as light storage luminescent ink, How to apply this on a proper process sheet, vaporize this solvent, and make it form; it can create by methods, such as method; which prints this light storage luminescent ink completely on a resin sheet which consists of congener or a resinous principle of a different kind. Such light storage luminescent ink can be used also when printing in a layer which is in the surface of a whole surface retroreflection sheet, or its upper part as mentioned above.

[0053] In order to stick this light storage light-emitting sheet on predetermined adherend, heat sensitivity type or pressure sensitivity type adhesives layer, a releasing base, etc. may be formed in the back one by one at such a light storage light-emitting sheet as well as a case of the aforementioned whole surface retroreflection sheet. It is the same as that of a case of a retroreflection sheet also about a kind of resin which forms this adhesives layer, for example, acrylic resin, silicon system resin, rubber system resin, phenol system resin, etc. are used, it excels in endurance especially and good acrylic resin or phenol system resin of the adhesion characteristic is used suitably.

[0054] Said light storage luminescence retroreflection sheet (C) suitably used for formation of an information-display object (2) in this invention refers to that by which a retroreflection field and a light storage luminous region are regularly distributed in one sheet. A retroreflection field in this light storage luminescence retroreflection sheet (C), Like a case of said whole surface retroreflection sheet, various kinds of above-mentioned retroreflection elements, By namely, an open lens mold retroreflection element, a capsule lens mold retroreflection element, an enclosure lens mold retroreflection element, a capsule cube-corner type retroreflection element, or a metal deposition cube-corner type retroreflection element. It is preferred to be especially formed of a capsule lens mold retroreflection element or a capsule cube-corner type retroreflection element.

[0055] As a manufacturing method of these light storage luminescence retroreflection sheet (C), When a retroreflection element is a capsule lens mold retroreflection element, For example, a bond part which connects a light transmittance state enveloping layer and a support layer is formed by a method of printing said light storage luminescent ink, A light storage luminous layer is selectively provided in this by printing of this light storage luminescent ink also like a capsule side surface of this enveloping layer if needed, How to make these portions a light storage luminous region; The near upper surface of a support layer under which a layer of a minute sphere lens is laid at least is formed with a light storage luminescence resin composition, a law from behind this support layer (side under which a minute sphere lens is not laid) -- a layer of a minute sphere lens being laid underground selectively, being formed, and on a support layer formed with a method; light storage

luminescence resin composition which performs heating embossing shaping by a method and forms a bond part as a light storage luminous region, a law -- heating embossing shaping can be performed by a method, a bond part can be formed, and method; etc. which carry out the light storage luminous region of a portion and a bond part of a minute sphere lens under which a layer is not laid can be mentioned.

[0056]The surface of a side which is not laying underground the surface by the side of light incidence of a support layer, i.e., a minute sphere lens, when a retroreflection element is an enclosure lens mold retroreflection element and/. Or it is preferred to form a light storage luminous region in the surface by the side of a support layer of a surface protection layer laminated at the light incidence side of this support layer by methods, such as printing of the aforementioned light storage luminescent ink, and to put this light storage luminous region between it in the shape of sandwiches by surface protection layer and a support layer.

[0057]When a retroreflection element is furthermore a capsule cube-corner type retroreflection element, it is preferred to form a light storage luminous region under a light transmittance state surface protection layer laminated if needed under a light transmittance state enveloping layer and/or on a light incidence side surface of this enveloping layer. A part or all of a bond part that has connected selectively a light transmittance state enveloping layer and a support layer can specifically be made into a light storage luminous region, A light storage luminous region can also be formed in the surface by the side of light incidence of an enveloping layer, i.e., the near surface in which a cube corner is not formed, and the surface by the side of an enveloping layer of a surface protection layer laminated at the light incidence side of this enveloping layer.

[0058]About details of a manufacturing method of these light storage luminescence retroreflection sheet (C). For example, JP,7-11250,A, the Japanese-Patent-Application-No. No. 185331 [eight to] specification, It writes in the Japanese-Patent-Application-No. No. 282901 [eight to] specification, an international patent application number JP 97/No. 01649 specification, etc., and a light storage luminescence retroreflection sheet which can be used for this invention can also be manufactured in accordance with a method of a statement to these.

[0059]In a light storage luminescence retroreflection sheet (C) which can be used conveniently for this invention, When a gross area of the surface by the side of light incidence of this light storage luminescence retroreflection sheet (C) is generally made into 100%, A rate of area of a retroreflection field is 20 to 40% of within the limits preferably 15 to 50%, A rate of area of a light storage luminous region is 80 to 60% of within the limits preferably 85 to 50%, and it is good to set up suitably the sum total of a rate of area of a retroreflection field and a light storage luminous region as for at least 90% of within the limits become 100% preferably.

[0060]Say area of the above-mentioned retroreflection field, for example, area of a portion which actually has a retroreflection function in the case of a capsule lens mold retroreflection field, From a gross area of the surface by the side of light incidence, from this retroreflection

field, a portion by the side of light incidence, That is, it is equivalent to a value which deducted area of retroreflective-properties loss portions, such as a bond part formed of the surface of a light transmittance state enveloping layer or a light transmittance state surface protection layer, a light storage luminous region of optical impermeability formed by printing etc. on a direct-recursion reflection region, and partial heat melting modification of a support layer.

[0061]In the case of an enclosure lens mold retroreflection field, from a gross area of the surface by the side of light incidence. It is equivalent to a value which deducted area of retroreflective-properties loss portions, such as a light storage luminous region of optical impermeability formed in the surface of a light transmittance state surface protection layer, a portion, i.e., a light transmittance state enveloping layer, by the side of light incidence, by printing etc. from this retroreflection field.

[0062]In the case of a capsule cube-corner type retroreflection element, From a gross area of the surface by the side of light incidence, from this retroreflection field, a portion by the side of light incidence, That is, it becomes the value which deducted area which retroreflective-properties loss portions, such as a bond part formed of a light storage luminous region of optical impermeability formed in the surface of a light transmittance state enveloping layer or a light transmittance state surface protection layer by printing etc. printing, etc. and partial heat melting modification of a support layer, occupy.

[0063]In order to stick this light storage luminescence retroreflection sheet (C) on predetermined adherend, heat sensitivity type or pressure sensitivity type an adhesives layer, a releasing base, etc. may be formed in the back one by one at such a light storage luminescence retroreflection sheet (C) like a case of a whole surface retroreflection sheet and a light storage light-emitting sheet. It is the same as that of a case of a retroreflection sheet also about a kind of resin which forms this adhesives layer, for example, acrylic resin, silicon system resin, rubber system resin, phenol system resin, etc. are used, it excels in endurance especially and good acrylic resin or phenol system resin of the adhesion characteristic is used suitably.

[0064]Said color sheets used for formation of an information-display object (2) in this invention if needed, To same resinous principle, with having used for the aforementioned light storage luminescence resin composition, for example Titanium oxide, A zinc oxide, carbon black, rouge, Hansa yellow, copper phthalocyanine blue, . Are used colorant of organicity or inorganic matter, such as the Quinacridone red, and if needed. A resin composition for coloring which blended suitably various additive agents, such as a fluorescence artificial color agent, light stabilizer, a thermostabilizer, a bulking agent, and a cross linking agent, hot extrusion molding, How to fabricate to a sheet shaped by methods, such as press forming; Into a proper organic solvent, make it dissolve or distribute and this resin composition is made into color ink, How to apply this on a proper process sheet, vaporize this solvent, and make it form; it can create by

methods, such as method; which prints this color ink completely on a resin sheet which consists of congener or a resinous principle of a different kind.

[0065] Said protective sheet used for formation of an information-display object (2) in this invention if needed has high transparency, it has flexibility, and same resinous principle is suitably used with what is necessary being strong just to have used for said light storage luminescence resin composition. As such a resinous principle, for example Acrylic resin, urethane system resin, Although polyester system resin, fluoro resin, VCM/PVC system resin, vinyl acetate system resin, polyethylene system resin, a polypropylene resin, polycarbonate system resin, etc. are mentioned, and these are independent respectively, it is the form by which copolymerization was carried out or it is blended and used, excelling in weatherability in these -- processing -- proper good acrylic resin, urethane system resin, polyester system resin, and fluoro resin are preferred, and acrylic resin is the most preferred.

[0066] As shown, for example in said drawing 1 and 2, a luminescence type information display device of this invention, An information-display sheet (4) currently formed by composition described above is stuck on the surface of a plate (3). A protective sheet (5) is stuck on the surface of this information-display sheet (4) if needed. While protecting this information-display sheet (4) from dirt, such as rain and dust, it is useful to raise weatherability, and an information-display object (2) is constituted by combination of these plates (3), an information-display sheet (4), and a protective sheet (5). Such an information-display object (2) is fastened on to a support (1) set up by road side edge by a fastening member of a plate (3) in back. And near the top chord of this information-display object (2), a light irradiation device (9) which irradiates with light of a wavelength area which includes ultraviolet rays intermittently or intermittently is formed.

[0067] The above-mentioned support (1) is various shape sections which comprise a metallic material or fiber reinforced synthetic resin a columnar article which it has, and as a metallic material, For example, can use steel, stainless steel, aluminum, an aluminum alloy, etc. by which corrosion treatments-proof (plating, paint, etc.) were carried out to the surface, and as fiber reinforced synthetic resin, For example, fiber reinforced resin etc. which serve as textile materials, such as glass fiber, carbon fiber, and a synthetic fiber, from synthetic resins, such as unsaturation polyester system resin, epoxy system resin, polyolefin system resin, VCM/PVC system resin, and acrylonitrile styrene-butadiene-rubber system resin, for example are usually used.

[0068] Said information-display sheet (4) is stuck on the surface by using as a substrate a metal plate which consists of the above-mentioned metallic material, and a plate (2) is attached to a support (1) with attachment lug via a rib formed in a rear face.

[0069] Generally 310-400 nm of light irradiation devices (9) furthermore used for this invention are designed preferably turn to an information-display object (2) side light including ultraviolet

rays of a 330-395-nm wavelength area, and irradiate with it intermittently or intermittently. Since light storage excitation of the light storing material which can be conveniently used in this invention is most effectively carried out by ultraviolet rays of this specified wavelength region, this light irradiation device (9) should just mainly irradiate with ultraviolet rays of such a wavelength area. As such a light irradiation device (9), a black light fluorescent light, a black light distant place exposure machine, etc. can use what is generally marketed, for example. [0070]What is necessary is just to perform an exposure of light in this invention intermittently or intermittently so that light emitted from a light storage luminous region (B) of an information-display object (2) may be maintained at a range which does not lose visibility. It is good to carry out an optical exposure with a light irradiation device (9), for the purpose, so that the following formula may be satisfied.

[0071] $EL > 0.3$ and $\theta > 0.6 - 0.65 < E\theta/L < 3000$ -- and -- $n \geq 0.3$ -- especially -- $EL > 0.6$, $4.0 < \theta < 360$, and $3.0 < E\theta/L < 2700$ -- and -- $n \geq 1$ [However, as for ultraviolet-rays output (W); L of a light source, in E, optical irradiation time (second); n per time of a light source expresses the number of times of an exposure per hour, as for distance (m); θ from a light source to a light storage luminous region.]

[0072]An ultraviolet-rays output specifically uses UV fluorescent light which is 0.246W, for example with a light source of 4W/6V, When installing a light source in a position which is distant from a light storage luminous region (B) of an information-display object (2) 30 cm, Light storage luminescence in night is maintainable by setting up repeat an optical exposure for 4.0 to 3300 seconds once or more per time still more preferably in 60 minutes so that an optical exposure for 0.79 to 3300 seconds may be preferably repeated once or more per time in 200 minutes. When an ultraviolet-rays output installs a light source in a position 1 m away from a light storage luminous region (B) of an information-display object (2) for example, using UV fluorescent light which is 7.40W with a light source of 40W/100V, It becomes possible by setting up repeat an optical exposure for 4.0 to 360 seconds once or more per time preferably in 60 minutes to maintain light storage luminescence in night so that an optical exposure for 0.09 to 370 seconds may be repeated once or more per time in 200 minutes.

[0073]Furthermore in this invention, light-receiving intensity in the surface of an information-display object (2) setting out of a light irradiation device (9), For example, it is good to be made to be irradiated with ultraviolet radiation of the range of $0.01 - 3.0 \text{ mV/cm}^2$ every 10 minutes for 1 to 10 minutes in 10 to 50 seconds, or 2 hours, for example preferably 30 seconds or more 3 seconds or more.

[0074]As for especially a power supply of a light irradiation device (9) in this invention, although it may not be limited and a thing from the usual commercial power may be used, in order to maintain visibility outstanding also at the time of interruption to service by accident, a disaster, etc., it is preferred to use storage batteries, such as a electric double layer capacitor,

as a power supply, for example. And this storage battery is good to make it always charge according to a power supply. In this case, it is preferred to set up so that regulation of choosing a kind of storage battery and energization for accumulation of electricity being turned on and off by a level of the amount of required accumulation of electricity of a storage battery may be performed. Of course in charge of a storage battery, the commercial power can also use a solar cell as a power supply.

[0075]If the information-display object (2) receives an exposure of lights, such as a headlight of a vehicle, at night etc., when a retroreflection field (A) of this information-display object (2) carries out retroreflection, and it shines brightly and light has not hit, as for a luminescence type information display device formed in this way, a light storage luminous region (B) will shine brightly. And although light storage ***** declines gradually and visibility is lost in an information-display object having a conventional retroreflection field and a light storage luminous region, Since light which includes ultraviolet rays of a specified wavelength region automatically from a light irradiation device (9) combined with this information-display object (2) is irradiated towards an information-display object (2) before light declines and visibility is lost in a luminescence type information-display object device of this invention, Light storage excitation of the light storing material included in a light storage luminous region (B) is carried out, and visibility which continued at night and was excellent is maintained.

[0076]

[Effect of the Invention]A retroreflection field (A) and a light storage luminous region (B) are formed in the information-display object (2) surface, and the luminescence type information display device of this invention. If the light irradiation device which irradiates the surface of this information-display object with the light of the wavelength area which includes ultraviolet rays intermittently or intermittently possesses and the exposure of lights, such as a headlight of a vehicle, is received at night etc., When the retroreflection field (A) of this information-display object (2) carries out retroreflection, and it shines brightly and light has not hit, a light storage luminous region (B) shines brightly. And since the light irradiation device (9) combined with this information-display object (2) turns to an information-display object (2) the light which includes the ultraviolet rays of a specified wavelength region automatically and is irradiated before the light which this light storage luminous region (B) emits declines and visibility is lost, the visibility which continued at night and was excellent is maintained.

[0077]Thereby as compared with the signs which becomes 1/10 or less, and energy saving of is attained as compared with the case where this information display device is illuminated continuously, especially are conventionally illuminated by commercial power, the large reduction of an electric power expense of the electric energy in the night of this information display device is attained.

[0078]For example, also at the time of interruption to service by accident, a disaster, etc., in

the case of the information display device which uses a storage battery as a power supply, an escape guide sign with high visibility can be provided through night, and the human damage in these emergencies can be suppressed to it to the minimum.

[Translation done.]